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# Industry Study

# Final Report
# *Strategic Supply*


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# STRATEGIC SUPPLY 2006

**ABSTRACT:** When studying Strategic Supply in the context of Supply Chain Management (SCM), it is quite apparent that Strategic Supply cannot be classified as a particular industry; but rather, as an enabler across all industries. It is through the proper execution of Supply Chain Management that industries begin to develop competitive advantage in the market place. Effective and efficient Supply Chain Management lowers cost, ensures consistent supply of resources, and increases the velocity of products to the customer.

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## PLACES VISITED

### Domestic

Defense Logistics Agency, Fort Belvoir, VA
Defense Distribution Depot, Susquehanna, PA
GENCO, Fogelsville, PA
Giant Foods Inc., Mechanicsburg, PA
FEDEX, Memphis, TN
International Paper, Memphis, TN
Anheuser Busch, Columbus, OH
Limited Brands, Columbus, OH
Papa John's, Louisville, KY
United Parcel Service, Louisville, KY
Toyota, Georgetown, KY
Wal-Mart, Petersburg, VA

### International

Canadian Tire Company, Toronto, Canada
FEDEX, Hong Kong
Invest Hong Kong, Hong Kong
Hong Kong International Terminals, Hong Kong
Hong Kong Trade Development Council, Hong Kong
American Presidents Line, Hong Kong
Hong Kong Border Customs Agency, Hong Kong
IDS Logistics, Hong Kong
LuenThai, Dongguan, China

## Introduction

When studying Strategic Supply in the context of Supply Chain Management (SCM), it is quite apparent that Strategic Supply cannot be classified as a particular industry; but rather, as an enabler across all industries. Therefore, our industry study looked at Strategic Supply as an integrated process performed by industries to obtain comparative and competitive advantage in the global marketplace. The Council of Supply Chain Management Professionals (CSCMP) has defined SCM as, "…encompassing the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies (CSCMP, 2006)."

Our site visits to industry revealed that the current condition of Supply Chain Management can be best described under one of three categories: (1) Information Technology Solutions, (2) Supply Chain Security, and (3) Strategic Alliances. These three aspects encapsulate the current innovations within the supply chain and paint the picture of future innovations to come. In addition, the supply chain has been greatly affected by globalization. Due to recent international competition brought about through globalization, more emphasis has been placed on improved supply chain operations in order to secure profit margins and improve efficiencies.

Globalization has made, and will continue to make, important and lasting changes to the way leading-edge companies conduct business. One major impact is the way the supply chain is managed. Innovations in Supply Chain Management have enabled companies to enhance inventory management so that profits are maximized and inventory costs are minimized. What once took companies six weeks to process and deliver can now be accomplished in days. The worldwide proliferation of the internet and the increased movement of goods from one place to another have forced industries to improve their business practices and processes in order to compete. During our industry visits, we discovered improvements in the areas of technology, security, and strategic alliances. The supply chain, as a whole, has seen revolutionary change over the past several years.

This revolution, in part, is due to technological breakthroughs in Enterprise Resource Planning (ERP) and Radio Frequency Identification (RFID) systems that allow constant tracking of orders throughout the process. The improvements in the technologies that drive supply chain management created a commiserate innovation in supply chain processes. However, technology alone has not been the sole area of improvement in Supply Chain Management.

Following the events of September 11, 2001, there has been an increased concern over the security of goods as they cross international borders; more specifically, those issues relating to the "chain-of-custody" of containers being shipped across international borders. These security measures focus on thwarting the movement of illegal weapons, immigrants, drugs and weapons of mass destruction (WMD). Innovations in both technology and process have improved the security of shipments and further enabled the supply chain of several industries.

Finally, many companies have established strategic alliances in order to improve supply chain operations and management. External alliances such as Third Party Logistics (3PL) operations have had a positive impact on industries across the board. In addition, companies have begun to look internally at a strategic level, and have started shaping products, processes and people in order to improve their supply chain operations and management. As companies

continue to integrate both horizontally and vertically, strategic alliances will play an integral role in successfully achieving a company's strategic goals and objectives.

Information technology solutions, supply chain security, and strategic alliances quickly became the focus of our industry study and this paper. We looked ahead towards the future of Supply Chain Management and the improvements possible through adoption of advanced technologies and best practices in these three areas. In addition, a thorough assessment of these areas will reveal the U.S. Government's role as it relates to supply chain operations within industry as well as the positive impact industry has had on supply chain effectiveness and efficiency across the entire spectrum of Supply Chain Management. This, in turn, will lead to recommendations that could be incorporated into existing Department of Defense (DoD) supply chain operations to further enhance its supply chain processes.

## Information Technology Solutions

During our visits to industry, we found, time and again, the importance that today's modern technology plays in supply chain management operations. Most significant to supply chain operations has been the positive impact of both Enterprise Resource Planning and Radio Frequency Identification. Companies who are leaders in supply chain management have pursued both of these initiatives with great success.

### *Enterprise Resource Planning*

Beginning in the 1970's, civilian corporations began pursuing information technology solutions. By the 1990's companies started integrating business processes under the concept of Enterprise Resource Planning (ERP). The pursuit of innovation, product differentiation, cost effectiveness and overall better management as an integral part of a company's competitive advantage have been the driving factors for significant advances in computer based information technology (IT). Businesses that are actively pursuing an ERP environment, structured to their company's processes, are on the leading edge of the next major evolution in business management and increased productivity (Vogel and Kimbell, 2005). Understanding the definition of ERP, coupled with a look at the possible future development and way ahead for ERP environments within civilian industry, can provide a road map for ERP implementation within DoD.

***Enterprise resource planning defined.*** Enterprise Resource Planning can be defined as, "a set of software applications that are intended to integrate and streamline business processes (Vogel and Kimbell, p.7, 2005)." That is a fairly broad definition and can encompass many different software applications within a company. But it does point to a basic fact that has been observed on many of our visits to several company headquarters. Businesses desire faster and more efficient computer software solutions to enhance the decision-making process and day-to-day operations at the executive level and below, and between departments within a company, through the collection and translation of data into real-time, actionable information. Our studies have shown that the mastery of Supply Chain Management is set firmly upon the foundation of effective data management. In other words, manage the data quickly and accurately, and the company's supply chain operates at an effective and efficient rate. A perfect example is Wal-Mart, an industry leader in Supply Chain Management, who has attained that position, in large part, through the integration of advanced information technology into day-to-day operations.

***2000 and Beyond: The Challenge (Tomorrow).*** In looking towards the future of ERP, Vogel and Kimbell stress the importance of defining the Enterprise System Architecture (ESA). They define ESA as, "…part of a roadmap for becoming business model-driven: It outlines how technology can support business processes, and how services can provide the flexibility for your business to innovate." The underlying premise of this definition is that business processes should drive technology vice technology driving business processes. In line with that thought process are the comments of Edward Sheehan, Senior Vice President and Chief Financial Officer of Concurrent Technologies Corporation. In a recent conversation he stressed that companies should ask what data and processes are important to the growth of their company and what metrics would best define success. Once companies have defined and mapped the business processes and key performance indicators (KPI's) or metrics, they should begin to search for an integrated IT solution that best meets their needs (E. J. Sheehan, personal communication, April 5, 2006).

Companies must begin transitioning from legacy-type information systems that have difficulty passing data between departments and begin moving to a fully integrated ERP environment. However, companies still face the challenge of which path to take in integrating data to enhance everyday business practices. In a CIO Magazine article, author Ben Wharton described the fork in the road facing most company CIO's as a "Single Instance[1]" scenario versus a web-based implementation of ERP (Worthen, 2003).

Worthen defined the Single Instance scenario as "…getting rid of your existing ERP and other best-of-breed systems-such as purchasing and CRM [Customer Relationship Management]-and replacing them with a single monolithic system from a single vendor. Everything your company needs-financials, order entry, supply chain, CRM-would come from SAP, Oracle, PeopleSoft, whomever (Worthen, 2003)." The advantages to a single instance scenario, in part, relate to U.S. Federal financial regulatory requirements under Sarbanes-Oxley (Worthen, 2003). After the ENRON and WorldCom financial fiascos, the government put into place extremely stringent financial accountability requirements on publicly traded companies. Among these requirements are traceable audit trails, which are exactly what a Single Instance, fully integrated ERP environment can provide (Worthen, 2003). However, web-based technology also offers companies a possible path for attaining a fully integrated ERP environment.

With the advent of web-based computer language such as HTML and HTTP, computers can begin to pass data and interface with each other more easily. As Vogel and Kimmel describe it, "One great thing the Web does, for example, is to use a standard way of formatting and transmitting information to and from a browser using HTML and HTTP… [In addition] [w]hen one application wants to have a chat with other applications to access some data or function, it uses a standard format called Web Service Description Language (WSDL) to describe itself to the other applications (Vogel and Kimmel, p20, 2005)." A good example of this type of technology in action is when consumers order items from their home computer through the internet without requiring their computer to have a company's particular software package to accomplish the task (Vogel and Kimmel, 2005). The significance of this is that companies now have a way of integrating legacy IT systems using web-based technology avoiding the costs of acquiring new systems (Worthen, 2003).

There are significant factors behind the two possible paths for a fully integrated ERP environment. Simply put, the Single Instance scenario offers a single solution to meet a

[1] "Single Instance" is a term used by Worthen in his article.

company's entire needs and reduces the number of systems within an ERP to one; thus, lowering maintenance costs associated with managing multiple information systems. However, a Single Instance scenario can be very costly to implement. As a possible alternative, many companies are waiting for web-based technology to further mature in order to avoid costs associated with a Single Instance scenario, avoid adaptability problems of "canned" ERP systems to unique business processes, and to take advantage of web-based technology's ability to better exchange information with outside entities over a Single Instance scenario (Worthen, 2003). During a recent visit with a major company headquarters, they described the ERP fork in the road as "driving a Ford and wanting to switch to a Cadillac with the caveat that you are moving at 55 mph down the road while trying to make the switch." It is costly and difficult; companies are not sure when a Single Instance scenario will begin to pay for itself.

Whether Single Instance scenario or web-based technology, the ERP environment enhances a company's operations providing more accurate data for decision making while reducing costs. Currently, there are several companies offering IT solutions to form an ERP environment. However, during our visits to industry, many companies referred to the use of ERP software supplied by a company named Manugistics.

***Manugistics: An ERP software provider.*** Manugistics is a leading global provider of supply chain and revenue management technology solutions in commercial industry. Through information technology the company has developed software solutions that synchronize the extended supply chain to improve its overall performance and are considered best of breed. Their Supply Chain Management solutions are custom made to address niche markets such as the courier industry, retail merchandizing, and the travel industry (Business Wire, 2006). One of Manugistics strengths is providing business solutions that address changing needs as companies continue to innovate and globalize in order to stay competitive. Manugistics' global customer base includes such business leaders as Sears, Limited Brands, DHL, Circuit City, Cingular, Nestle and IKEA (Manugistics, 2006).

The Strategic Supply Chain Industry Study Group visited two of Manugistics' customers. The first, location is currently implementing Manugistics' web-based demand and supply chain management solutions including collaborative logistics management for both inbound and outbound planning, optimization and execution. The second location is utilizing the Manugistics demand planning forecasting module to better optimize inventory and service levels. Since implementing the system, average inventory turns have increased.

Other global customers have also reaped the benefits of the Manugistics software. IKEA, Sweden's retail icon, turned to Manugistics after a mid-1990s ERP implementation failed to fix their forecasting problems, which gave way to fluctuating inventory levels. IKEA implemented Manugistics' demand planning application coupled with a production-planning solution. Their target was 10% reduction in their Distribution Centers (DC) inventory levels, and a settling of inventory fluctuation. They also wanted a single integrated planning platform that would provide a common working system for the product retailer manager worldwide. Manugistics' software solutions provided better results than expected. For the 16-week test, the DCs were able to reduce inventory levels by 20% for the 150 items included in the test phase (Sheraga, 2005). McDonald's Europe is also using Manugistics solutions to synchronize the perishable food supply chain. This is a unique challenge facing the fast food giant's global Supply Chain Management. McDonald's is utilizing sophisticated logistics and distributions systems to resolve many of the inherent challenges of a perishable supply chain, such as out-of-stocks, freshness,

inaccurate orders and excessive promotional inventory. These are delivered through an integrated supply chain approach, supported by market-leading applications of Manugistics. Through higher levels of forecast accuracy and greater supply chain visibility, they have already gained quantifiable efficiencies in restaurant inventories, product and recipe usage yields, as well as reductions in waste, and transport and purchasing costs (e-consultancy, 2006).

As a result of this research we have come to understand ERP as not simply a piece of software; but rather, more of a business mindset that is supported through information technology solutions. It allows for the timely and accurate transfer of information giving companies a competitive advantage in the market place. We have also discovered ERP to be a software concept that has evolved over several decades and will continue to evolve as technology improves.

***Radio Frequency Identification (RFID)***

Suppliers, shippers and retailers in the world of supply chain management can hear the sound of heavy, fast moving footsteps. It is the sound of radio frequency identification (RFID) mandates from an increasing number of customers. In late 2003, Wal-Mart put out a mandate that required its top 100 suppliers to put RFID tags on all cases and pallets they ship to the pilot RFID distribution center beginning in January 2005. Since that time, other retailers including Target, Albertsons, Best Buy, Tesco (U.K.), and the Metro Group (Germany), have all announced RFID mandates of their own (Shutzberg, 2004). In 2003, the U.S. Department of Defense issued a policy that standardized the use of active RFID and mandated the use of passive RFID beginning in 2005. More recently, Wal-Mart announced that they were extending the RFID requirements to the next 200 top suppliers by January 2006 (Shutzberg, 2004). RFID and its impact on the supply chain management is of interest to all supply chain management professionals.

This section is a brief survey of RFID, its impact on commercial supply chains and its potential for enabling the DoD's logistic processes. We will look at the types of RFID technologies available to users, the developing standards and some of the ways that RFID is being used in both the commercial and military worlds. Finally, this section will look at some of the future technologies and applications being developed by the US Military and their potential impacts on military logistics.

***The technology.*** RFID is an automatic data capture technology that uses radio-frequency waves to transfer data between a reader and a movable item to identify, categorize, track or initiate an action. RFID is fast, reliable, and does not require physical sight or contact between reader/scanner and the tagged item. All RFID systems, regardless of their function, consist of one or more tags, two antennas and a transmitter. The transmitter generates a radio signal which activates the tag and causes it to return a signal or perform an action (i.e. start your car's engine) or both. For RFID users such as retailers, manufactures and the DoD to leverage the technology's potential, a link is required between the tags and a database. Data from the tag must be transmitted to a reader or integrator and the reader must, in turn, be connected to a database or management information system that can accept the data carried by the tag or cross-reference the tag's identity with other information that is of interest to the user. RFID tags come in a wide variety of shapes and sizes, and their capabilities vary as well. Although there are a number of types of tags--passive, battery assisted, active, backscatter, different frequencies, tag talks first, reader talks first, etc.--the most common method of grouping them is by referring to their source

of power. Passive tags have no internal source of power and the tag converts a part of the received signal from the reader and, utilizing a technique known as backscatter, replies. This does not involve a transmitter on the tag, but is a means of "reflecting" the carrier wave and putting a signal into that reflection. As a result, the tag is inactive (or passive) when it is not in the beam of a reader. The active tag, on the other hand, carries its own battery. Battery assisted tags are just like passive tags (they use backscatter) but they have a battery that provides some power and increases the range that the tag is able to transmit over (Halliday, 2002). Both active and passive tags can be read-only or read and write but normally, only passive tags are read-only. Read-write tags can be written many times during their life and offer the most functionality (Scharfeld, 2001).

The different sources of power result in much different functional capabilities:

*1) Range:*

Passive tags are limited in range since the power of their signal is very weak. Passive tags normally work at distances of three meters or less. Active tags with their own power supply broadcast much stronger signals and can communicate at ranges up to 100 meters (Savi, 2006).

*2) Tag Collection:*

The different sources of power for passive and active tags also affects how many tags can be collected or read at one time and how fast tags can move through a reader's beam. Again, it is the method of power that is the limiting factor. Each tag is queried by the reader and replies in turn and the entire transaction can take some time if there are a large number of tags and the entire operation must be completed before the tags leave the reader's range. One passive system in use today requires more than three seconds to identify twenty tags. Combined with its short range, this means that the tags cannot be moving much more than a walking pace as they pass the reader (Savi, 2006). While this might work well in some situations it would not in others (for example, at the in-gate of a port or on a rail line). Active tag readers can interrogate and receive signals from thousands of tags in a much shorter period of time. Additionally, the tags can move past the reader at much higher speeds.

*3) Data Storage:*

Both passive and active tags can store data. However, the storage capability of passive tags is more limited. Normally, a read/write passive tag can store approximately 128 bytes of information. Active tags, with their own power source can store much larger amounts of data on the order of 128K bytes. Additionally, the tag can be programmed to make this data searchable (Savi, 2006)

*4) Cost:*

Everything has its price and the increased range and versatility of active tags comes at a price. Passive tags range in price from as little as $.01 for a simple inductive EAS (Electronic Article Surveillance) tag to as much as $40 for a battery-assisted, read-write tag able to store data. The more powerful active tags begin at approximately $75 each and can cost as much as $190 depending on power, size and life of battery, and storage capability. The interrogators for the tags increase in price in concert with the increasing capability (and cost) of the tags with which they interface (Jackson, 2005).

***Commercial applications.*** RFID is already in widespread use in the commercial world. The biggest demand for RFID hardware in the year 2000 was industrial/manufacturing and transportation, distribution, and warehousing organizations (Laird, 2001) and this trend has continued. However, companies and governments are using RF technology for a host of

applications. In all cases, RFID is used to replace some other method of manual or semi-manual data verification and entry. Some current applications grouped by type of tag are outlined in Appendix A and some examples of actual uses by specific companies are in Appendix B. Appendix C lays out a generic picture of potential RFID applications and benefits across the supply chain (Kambil & Brooks, 2002).

***DoD policy.*** The DoD has been a major user of RFID for logistics since the 1980s. In the 1990s, the US Army began deploying an active tag, RFID system to identify intermodal containers and vehicles in transit. One of the main goals of this system was to prevent a replay of what happened during Desert Storm. During that conflict, logisticians would order items, ranging from tools to ammunition and, if they did not get it in what they felt was a timely manner, they would order more "just in case." This resulted in thousands of containers in the ports with no idea of what was in them or to whom they were destined. In fact, during Desert Storm, more than half of the 40,000 cargo containers shipped to the desert—including $2.7 billion worth of spare parts—went unused, according to a General Accounting Office report (Caterinicchia, 2003). Material managers were unable to 'see' what was on hand or in transit and had no confidence in the system's ability to get them what they needed when they needed it. The result was thousands of excess shipments and the buildup of unmanageable "iron mountains" of materials where badly needed items were indiscernible from excess.

The system deployed by the Army and developed by SAVI Technology uses active tags and readers connected to regional servers by the internet. The tags carry data identifying the vehicle or the container and its contents and are read, or 'pinged' when passed within 300 feet of an interrogator. The system works fairly well but for two problems. First, it has been an Army program and getting the other services or vendors to use the tags has not always been possible unless the Army provided funding. Second, the system requires an existing infrastructure of readers to operate. Setting up this infrastructure at existing US ports and overseas ports, camps and stations was relatively easy. However, the issue became much more difficult when operations suddenly moved to areas that had not seen a US military presence before (Afghanistan for example).

DoD's new RFID policy, first announced in October of 2003 and subsequently updated in 2004, addresses many of gaps in the current Total Asset Visibility (TAV) system. It directs two major changes to the way the military has been looking at RFID. First, it mandated the use of the current, Army only, active tag system for all services. Second, it mandated the use of passive technology and required suppliers to put passive RFID tags on the lowest possible piece/part/case/pallet packaging by January 2005 and the use of passive tags on key, high value items.

This new policy holds out the promise of far-reaching improvements in DoD's supply chain operations and the ability to give the warfighting commanders what they need–accurate, real-time total asset visibility down to the item level. Although many DoD components have recently begun experimenting with passive and active tags for a variety of programs, there has not been any overarching guidance. The Services and agencies were operating independently of the others developing systems that were not necessarily compatible. Now, at least for the time being, there is attention and oversight from the DoD level.

*Active Tag Policy*

Mandating the use of the current Army active tag system for the tracking of what the policy calls "Freight Containers;" i.e., 20 and 40 foot intermodal containers and air pallets will fill the gaps in the TAV picture by making this a Joint solution versus a single service project. The policy also addresses two key issues for the current active tag system--responsibility for establishing the necessary infrastructure and funding.

Infrastructure at the various nodes in the distribution chain has been a constant cause of disagreement among the DoD community. Under the new policy, responsibility for strategic air and sea ports both in the U.S. and overseas belongs to the U.S. Transportation Command (USTRANSCOM) while the combatant commander has the responsibility for outfitting theater level ports. If the container or pallet originates at a commercial vendor it is the responsibility of service or agency that is executing the procurement function to provide the necessary RFID equipment to meet the requirements of the policy.

*Passive Tag Policy*

Mandating of the use of passive tags beginning at the pallet and case level by January 2005 and then eventually expanding to the package and individual item, if successfully implemented, will provide the 'missing link' for DoD TAV. Military logisticians have had limited success during Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) gaining visibility of containers and pallets moving through the Defense Transportation System. However, they frequently did not have good visibility on what was in the container or on the pallet. For combat logistics support to work, the warfighter must be able to 'see' what is in transit down to the item level. Implementation of a DoD wide passive tag system will go a long way to fixing the problems experienced in OEF and, to a somewhat lesser extent in OIF. The provision of tags on cases and pallets means that a packing list for a container can be generated electronically as the tags pass a reader while being loaded into a container, the data can be transferred into the active tag system and be associated with that container on a manifest. Now, the movements manager in a theater can pull down the content information and track the container or pallet's current location allowing him to paint a picture of the 'warehouse in motion' and give current and accurate data to the warfighter. The use of passive tags will also simplify the reception of cargo at destination or at transfer nodes as containers are unloaded and cargo reconfigured for final delivery or for further movement. Anything that can be done to eliminate hand entry of data, especially in a tactical field environment, will both enhance the operation of the supply chain and shrink the size of the in-theater logistics footprint.

Much work remains to be done in RFID technology and application. However, mandating the use of the current active tag system is a great step forward. The future of the U.S. military is one of quickly mounted, expeditionary operations that will often be into areas in which we have had no presence and few friends. RFID technology can be an enabler to combat support operations in these austere locations.

## Supply Chain Security

"9/11" was a "wake-up" call for the international community to deal with the threat of maritime terrorism. In December 2002, the International Maritime Organization (IMO) adopted resolutions containing measures to strengthen maritime security and prevent acts of terrorism against international shipping (Beckman, 2005). These developments have triggered a response by private companies to develop innovative products that will meet the new maritime security

requirements in a cost effective manner. “Innovative companies are also developing logistics management software to help companies not only meet the new regulatory requirements, but at the same time improve inventory control and reduce administrative costs (Beckman, 2005).”

***Container Security***

Events of September 11, 2001 have greatly heightened security concerns in freight transportation. International container movement has been particularly highlighted as a concern (Onder, 2002). In the U.S., only five percent of nearly 10 million containers (27,000 per day) that arrive in the U.S. each year are physically inspected. The Transportation Security Administration (TSA) is in the process of implementing phase three of Operation Safe Commerce (OSC). OSC is a test of container-security technology and shipping practices. Its main goal is to develop solutions that will enhance a commercial operator’s security (Edmonson, 2005).

> Lawmakers and industry officials agree that more scrutiny needs to be given to what is inside containers, but exactly how that should be done, is a matter of dispute. Subjecting 100 percent of all containers to full inspection is neither feasible nor logical. Industry experts worry that new regulations for screening and inspecting cargo could place odious and costly requirements on shippers. An emphasis should be placed on inspecting cargo that is deemed high risk, while keeping containers moving through the ports (Strohm, 2006).

***Maritime Security Innovations***

Large vessels are vulnerable to attacks, hijacking attempts, and piracy. This is especially true at maritime “chokepoints” such as Straits of Hormuz, Suez Canal, Panama Canal, Strait of Malacca, and Bab el-Mandab (connects Arabian Sea to the Red Sea). One solution to this problem is the Automatic Identification Systems (AIS)--a shipboard broadcast system that allows ships to easily track, identify, and exchange pertinent navigation information with other ships and with shore-based facilities. “AIS systems are required on ships built after 2002 by IMO regulations. Small ships are exempted. Ports will be better able to cope with the threat of maritime terrorism if AIS systems are utilized by all ships passing through their waters, including small ships” (Beckman, 2006). The goal is for all ships to have this system. However, they are quite expensive, so until it is required by the IMO, many owners of ships built prior to 2002 will probably not buy it. Another regulation adopted by the IMO in December 2002, requires all ships over 500 gross tons be equipped with a Ship Security Alert Systems (SSAS). This system is capable of discretely raising the alarm to the relevant authorities and tracking the vessel if the security of the vessel is compromised (Beckman, 2006).

***Supply Chain Security Initiatives***

There is not one single technology that will solve supply chain security problems but items such as Radio Frequency Identification tags will be most effective when used with other technologies, such as global-positioning systems that can track container locations and electronic label seals that indicate a container’s contents and whether they have been tampered with (Greenemeier, 2004). After September 11, 2001, the U.S. Customs Service became U.S. Customs and Border Protection (CBP). CBP has developed a two-pronged strategy for supply chain security. First, companies assume responsibility for their supply chain security. One initiative is the Customs-Trade Partnership Against Terrorism, or C-TPAT. This is a voluntary

program where companies agree to take steps to adopt "best practices" to improve the security of their shipments and the security of the supply chain – from foreign loading docks to the U.S ports of entry. These companies that meet security standards are then given the "fast lane" through seaports (GLOBALSECURITY, 2003). There are currently three tiers of C-TPAT compliance, and containers belonging to members in the top tier sail through customs virtually uninspected (Worthen, 2006).

The second prong of CBP's strategy is to collect as much information as it can about what is happening in the supply chain so that, through data mining, it can spot anomalies. The key to this is the Automated Commercial Environment (ACE), a $3 billion-plus trade processing system begun in 2000 to be completed in 2010 (Worthen, 2006). Basically, this is the CBP's Enterprise Resource Planning system that will assist in targeting containers for inspection. An add-on to ACE is the Advance Trade Data Initiative (ATDI), which requires importers to provide every bit of information about a shipment. ATDI participation will be required for a tier-three C-TPAT certification (Worthen, 2006). To assist in the enforcement of these initiatives, the Sarbanes-Oxley Act (Sox) requires companies to put in place reasonable safeguards against events that could materially affect the company's value – events in the supply chain fall under the Sox umbrella (Worthen, 2006).

***Container Security Technology***

There are three main challenges in inspecting containers. First, it is impossible to inspect all of the containers passing through a port location. Secondly, it is difficult to detect tampering of containers during transit. Finally, it is difficult to detect weapons of mass destruction (WMD) (Smart-Trakker, 2004). Within months of the attacks on September 11, 2001, the Container Security Initiative (CSI) was implemented in response to the potential use of a maritime container as a delivery weapon. The primary purpose of CSI is to protect the global trading system and the trade lanes between CSI ports and the U.S. (CBP, 2006). CBP officers work with custom administrations from other countries to establish security criteria for identifying high-risk containers. CSI enables officials to separate high-risk and low-risk cargo in order to focus resources on high-risk cargo. CSI consists of four core elements:

1. Identify high-risk containers. CBP uses automated targeting tools to identify containers that pose a potential risk for terrorism, based on advance information and strategic intelligence.
2. Prescreen and evaluate containers before they are shipped. Containers are screened as early in the supply chain as possible, generally at the port of departure.
3. Use technology to prescreen high-risk containers to ensure that screening can be done rapidly without slowing down the movement of trade. This technology includes large-scale X-ray and gamma ray machines and radiation detection devices.
4. Use smarter, more secure tamper-evident containers, that will allow CBP officers at U.S. ports of arrival to identify containers that have been tampered during transit (CBP, 2006)

A new system we observed being tested in Hong Kong shows how technology can improve container screening. "Through the Integrated Container Inspection System, every container is put through a gamma-ray scanning machine and a radiation portal. Scanned images are then stored in a database, there they can be reviewed by inspectors (Strohm, 2006)."

> The need to enhance the security of containers has triggered the need to develop innovative technology to secure containers and to track them during their passage. Innovative companies are developing technology that will enable containers to be sealed electronically and monitored via satellite by computers. Security monitoring satellite communications equipment is installed inside the door of the container. The container door is sealed with a transponder after the security inspection has been completed. The container is then monitored from the point of deployment to the completion of the journey (Beckman, 2006).

GE Security working with China International Marine Containers Group is developing a Tamper Evident Secure Container (TESC). TESC uses a technology called an integrated Container Security Device. When a container passes within range of a wireless reader, a security device integrated into the container reveals to customs and logistics officials its location, time of arrival and whether it was opened by anybody without authorization en route (Carr, 2005). Other benefits include improved information on inventory status, better tracking and management of assets, improved responsiveness and customer service and improved tracking of shipping containers. This reduces labor costs, improves inventory availability and reduces stockouts (FOODQUALITYNEWS.COM, 2005).

As discussed above, container security products include the electronic seal that secures the hasp and rod bolts of the container doors. If the seal has been tampered with, it will communicate such upon interrogation by an electronic reader. There are low cost, low security capability seals (using passive RF technologies) and moderate cost, moderate security capability seals (using active RF technologies). The ISO container transponder is a device that is installed on both sides of the container; and, if a reader infrastructure is installed, transponders can be read in the port, on the highway and on the rail system (Onder, 2002).

Ultimately, the security of supply chain operations remains a challenging question faced by all supply chain participants. The globalization of our economy is exerting pressure on today's supply chain like never before. Global sourcing may offer significant cost advantages, but it also means long-distance supply lines, extended lead times, and increased risk. Innovation is needed. However, it will not solve all problems with movements within the supply chain. The following statement can best summarize it: "Experts agree that technology is but one piece of the puzzle. To optimize the supply chain business processes will need to change to take advantage of the technology (Maenza, 2006)."

## Strategic Alliances

The globalization and technology explosion of the 21st century has provided both benefits and challenges for strategic supply. While technology has provided greater visibility, reduced response times, and broader reach for the supply chain, it has also increased competition and created more pressure for companies to reduce cost and provide better service. This pressure necessitates a buyer-supplier relationship where the supplier can respond to buyer's needs in a timely manner. The nature of this relationship creates dependency on suppliers. This dependency can be satisfied through a strategic alliance, which is a long-term, goal-oriented partnership between two companies where risks and rewards are shared. These partnerships are "win-win" agreements, providing long-term commitments to acquire goods from the supplier while providing the buyer with favorable delivery terms to reduce costs and increase service levels.

Many of these strategic alliances manifest themselves in Third Party Logistics agreements and Reverse Logistics operations. In addition, companies have begun looking internally at improving product, process and people.

***Third Party Logistics (3PL)***

3PL is outsourcing a manufacturer/supplier's logistics functions to one or more providers as a third party, so the manufacturer/supplier can focus on its core competencies; e.g., manufacturing or food processing. 3PL as a supply chain enabler is not a recent innovation—the concept of outsourcing one's logistics functions started in the late 1980's (Ashenbaum, p. 48, 2005). There are several reasons behind the big push over the past 10 years to increase 3PL partnerships. "The move from a push to a pull supply chain management approach continues to be vital in the quest to reduce inventory, more effectively manage supply lines, and increase customer satisfaction (Partridge, p. 94, 2005)."

***Companies using 3PL.*** A 2005 Northeastern University survey indicated the U.S. industries most targeted by 3PL providers are in retailing, automotive, electronics, high technology, consumer goods manufacturing, and health care (Lieb, p. 24 2005). 3PL enables these manufacturers/suppliers to do what they do best, while outsourcing their logistics requirements. According to *Inbound Logistics'* Top 10 3PL Survey for 2005, United Parcel Service (UPS) Supply Chain Solutions is the top 3PL provider for the third consecutive year (3PL Top 10, p. 89 2005). UPS provides 3PL services for major companies such as Adidas, Ritz Camera, Toshiba, and Samsung (3PL Top 10, p. 90, 2005). One unique 3PL requirement was NASCAR entrusting UPS to move 80 NASCAR vehicles and equipment over 1,500 miles from California to Mexico (requiring over 500 import/export documents, visas, and manifests), then to Nevada (Harps, p. 74, 2005). Another unique 3PL requirement was United Nations World Food Program using 3PL provider TNT to distribute 60,000 metric tons of food aid to almost 2 million Asian tsunami survivors in December 2004 (Harps, p. 86, 2005).

***3PL and Supply Chain Management.*** With the influx of more organizations outsourcing their logistics requirements and processes at different levels, 3PL can easily become confused with other similar outsourcing terms. According to Langley, "As the industry continues to mature, 3PL providers evolve their business models to accommodate increasing customer expectations and capture additional market share," and he goes on to say that in the hierarchy of traditional outsourcing, this "business model" has migrated from the tactical level (Logistics Service Providers and 3PL) to the strategic level [Supply Chain Manager (SCM) and Lead Logistics Provider (LLP)], offering different service levels of outsourcing (Langley, p. 21, 2005). 3PL remains a solid outsourcing strategy at the tactical level.

***What 3PL providers provide.*** The 3PL industry has broadened its service offerings in response to manufacturers/suppliers' desire for one-stop shopping. "As more companies source, manufacture, distribute, transport, and sell products using vendors in every corner of the world, they count on 3PLs to streamline the supply chain through proactive vendor management and product lifecycle management" (Partridge, p. 96, 2005). According to Lieb, transportation and warehousing revenues still dominate most 3PL providers' services, but "… a number of the 3PLs have added nontraditional functions such as financial services, contract manufacturing, and procurement support to their service menu" (Lieb, p. 22, 2005). Surveys by Partridge indicate

truckload and less-than-truckload intermodal transportation are the most popular 3PL services (Partridge, p. 96, 2005). The percentage of *Fortune 500* manufacturers using 3PL services has increased from 38 percent to over 80 percent [from 1995 to 2005] (Lieb, p. 24, 2005). The trend is for companies to search their supply chains for processes that can be optimized to squeeze out costs and efficiency savings, which is an incentive for 3PLs to offer a wider variety of services (Partridge, p. 96, 2005).

***Opportunities in 3PL implementation.*** The 3PL industry continues to evolve and is changing how manufacturers/suppliers are viewing their 3PL providers. Benjamin Gordon describes the 3PL industry as "… undergoing a huge transition. Currently competing in a highly fragmented, high growth market, 3PL providers will soon be swept up in a massive wave of consolidations. This trend will be driven by three factors: the increased demand for lead logistics providers, the emergence of new technology, and an increase in cash-rich buyers seeking logistics targets" (Gordon, p. 50, 2003). Further, he points out that smart organizations already treat their 3PL partners as "true business partners" and they "… integrate 3PLs into their business and rely on them for critical supply chain functions" (Gordon, p. 50, 2003).

Globalization has broadened opportunities and markets for manufacturers/suppliers and 3PL providers, and in turn, has made supply chains more complex. As long as manufacturing continues to go overseas, the 3PL marketplace will grow (Navas, 2005). North America is currently the primary focus region for U.S. companies, but there have been an increasing number of companies seeking global logistics services, especially into China (Partridge, p. 94, 2005). Information Technology (IT) is another area of opportunity that manufacturers/suppliers increasingly seek from their 3PL providers. According to Partridge's survey, 86 percent of 3PLs offer information system services, in response to the fact that manufacturers and retailers are "jumping on the chance to increase supply chain visibility technology without sinking millions into infrastructure and software" (Partridge, p. 98, 2005). Armstrong & Associates identifies IT capability as one of the top three reasons companies choose a 3PL provider (Navas, 2005). Major 3PLs are developing IT systems that include a warehousing management system, transportation management system, and enterprise and financial systems, as well as a web-based architecture (Navas, 2005). Lieb's studies indicate 3PL providers are challenged by the high costs and low return in their IT investments (Lieb, p. 25, 2005). As companies become more reliant on real-time information in their business processes, this area will continue to become a greater opportunity for 3PLs to provide their clients.

***Reverse Logistics***

A new and emerging supply chain relationship between companies is a reverse logistics process. Reverse logistics involves the process of bringing materiel back through the supply chain for return, repair, or disposal. Many companies recognize the loss of time and additional expense required to manage a reverse supply chain without a comprehensive strategy. The profitability of managing reverse logistics has resulted in companies emerging as third party providers that handle returns for companies. An example we observed in our travels was a company named GENCO. GENCO has a contract with Sears and KMART to handle all of their returns (GENCO, 2006). This business has become a multi-million dollar a year business for GENCO and it relieves Sears and KMART from a non-core function (GENCO, 2006).

Returns can be complex and time consuming. The rise of these third party logistics providers has brought efficiency to an otherwise frustrating and poorly managed process. Major

logistics companies like United Parcel System (UPS) and FEDEX have collaborated with e-commerce vendors to achieve increased customer satisfaction by creating easy product returns. They have also increased the visibility of the return throughout the process and thus made crediting customers for the return occur more quickly and accurately. By making reverse logistics part of the life cycle consideration of a company, companies have increased customer loyalty, divested themselves of non-core functions and increased profits.

***Strategic Sourcing***

Strategic sourcing has long been associated with commercial supply chain optimization and is widely considered a procurement best practice. Traditionally, strategic sourcing is defined as a systematic way to build long-term and mutually beneficial customer-supplier relationships, where the loss of short-term competition is more than offset by the benefits of long-term pricing agreements, increased process insight, and improved product quality. However, in this "traditional view," application of strategic sourcing in the public sector, particularly in the DoD, is often seen as problematic due to the requirement for "open and fair" competition in all acquisition and procurement actions. The requirements of the Federal Acquisition Regulation (FAR) and DoD's stove-piped and parochial acquisition systems are often seen as barriers to widespread use of strategic sourcing. Fortunately (for us in DoD), this view of strategic sourcing is incomplete and overly narrow.

***Strategic sourcing, an expanded view.*** A web search for "strategic sourcing" reveals numerous definitions offered by various associations and authors. A typical one is offered by ICG Commerce, a procurement services firm: "Strategic sourcing is the process of formally selecting a vendor to supply a particular product or service that is routinely purchased by a company." They go on to state that the end result of this process is "a negotiated contract with a preferred supplier" (Frequently Used, 2006). Clearly, there are some good elements here: routine purchases, contract relationship, and preferred supplier. What's missing in this definition, we contend, is a better understanding of "strategic."

A more useful definition for our purposes is offered by an online procurement journal as "a systematic process that directs purchasing and supply managers to plan, manage, and develop the supply base in line with the organization's strategic objectives" (Ball, 2005). To paraphrase, strategic sourcing is all about choosing suppliers and establishing mutual relationships in a manner that directly supports an organization's strategic goals. Obviously, not everything procured is strategic. Many purchasing decisions are based on traditional "business" goals: faster, cheaper, better, etc. However, as noted by Ball, a product, service, or commodity that gives the business a competitive advantage should be strategically sourced, not just bought at the cheapest price. "Competitive advantage" might sound like a private sector term, but it clearly applies to the business of government, as well. In the case of DoD, we can substitute "mission critical" for "competitive advantage" and the definition becomes clear. For a simple illustration, consider the difference between buying large quantities of office paper and, say, jet fuel. The office paper is clearly important to the operation of the entire organization; they could not do business without it, and DoD could save some serious money by procuring it wisely, but it is not a strategic decision. Conversely, the acquisition of jet fuel is a strategic sourcing opportunity because it directly enables the organization to achieve its *raison d'etre* which, to borrow an Air Force phrase, is to "fly, fight, and win." Since DoD is not on the cutting edge, we can learn a

great deal by considering some private sector uses of strategic sourcing and observing a few of the key enablers they have discovered.

***The "3 P's."*** As in any human endeavor, the success of strategic sourcing is dependent on the participants' understanding of their **products** (goals, objectives, outcomes), and **processes** (methods, procedures, tools), as well as having the right **people** (skills, empowerment, incentives) to execute it. Within each of these areas, private industry has found some key enablers to making strategic sourcing work. The following are examples within each of the 3 P's.

*Product Enabler: Set Clear Strategic Goals*

Rockwell Collins designs, produces, and supports a broad range of commercial and government avionic systems. Rockwell Collins has an annual strategic and financial plan that emphasizes material availability, a highly competitive total cost of ownership, and asset management as strategic company goals (Avery, 2005). These strategic goals flow from the company president to the entire company supply chain. As a result of this focus, material lead-times into Rockwell Collins' factories have been cut from 46 to 30 days, total cost of ownership reduced by 6%, and on-time delivery of products improved from 83.8% to 96.5% in 2004. Total cost savings were $20 million on $1 billion of spending by using strategic sourcing to accomplish the company's strategic goals. Failure to set clear strategic goals for purchasing and procurement leads to highly sub-optimized solutions. This kind of leadership is essential for strategic sourcing to really deliver savings and performance improvements. Especially in the large organizations, essential tasks, such as purchasing, are "held tight" under local control. This practice is mainly due to subordinate organizations' lack of trust in centralized processes. This, of course, is human nature. We trust what we can control. Therefore, high-level leaders must champion strategic efforts and make sure the processes they put in place earn subordinate organization's trust by being reliable, repeatable, and transparent.

*Process Enabler: Requirement- to-Acquisition Alignment*

Bombadier Recreational Products (BRP), located in Valcourt, Quebec, is a wholly-owned subsidiary of Bombadier that was taken private and began operating separately in 2003 (Hannon, 2006). They are a well known manufacturer of personal watercraft, snowmobiles, and all-terrain vehicles (ATVs). With their newfound independence, BRP extensively reorganized. One of the major goals of their reorganization was to improve their supplier quality and responsiveness. To accomplish this, they chose to consolidate their purchasers and co-locate them with the product developers. In DoD vernacular, they discovered the enabler of requirement-to-acquisition alignment. By working together on a daily basis, the designers (requirement developers) now work with the supplier base and procurement issues in mind. As a result, they avoid unnecessary costs and problems in production. All too often, requirements are "thrown over the wall" from the designers to the procurers. However, this just does not apply to built-to-design items; it also applies to commercial products and even commodities. If the purchaser does not take the time to understand the requirement fully or develop an organization-wide perspective, money will be wasted, either by procuring products or services at too high a cost or with the wrong performance characteristics.

*People Enabler: Multi-skilled and Broadly Experienced Personnel*

According to World Trade magazine, Pitney Bowes is a $5.4 billion corporation that provides mail and document management services to over two million businesses worldwide (Bernstein, 2005). Pitney Bowes has discovered that having the right people is critical. In their case, they have completely rewritten their purchasing job descriptions and conducted targeted recruiting and in-house training to develop people with a blend of financial, business, contracting, and negotiation skills. The enabler Pitney Bowes has discovered is multi-skilled personnel with broad experience outside the traditional "purchasing" stovepipe. Purchasers with an overly narrow perspective too often get caught in the "transaction trap" where a purchase is seen in isolation and not as a leveraging or strategic opportunity. Having the right people, in the right jobs, is critical.

*Summary*

Strategic sourcing is best understood as smart spending that enables the organization's strategic goals. Not all products or services acquisitions are strategic. The key differentiator is whether the procurement is mission critical or directly supports an organizational top-level goal. Private industry has discovered several key enablers to successful strategic sourcing. First, you must understand the product; i.e., the strategic goals of your sourcing efforts. This must be a "top down" function derived from the organization's strategic plan and empowered by its top leadership. Second, processes must be aligned to eliminate the requirement-to-acquisition gap. Too often, sourcing requirements are thrown "over the wall" to the acquirers resulting in wasteful spending and unmet expectations. Finally, the organization must recruit and train multi-skilled and broadly experienced people. Narrowly-focused personnel lead to a "transactional" purchasing mentality and are corrosive to strategic sourcing efforts. DoD has resolutely stepped out to implement strategic sourcing; however, real progress will only be made when traditional stovepipes and barriers are broken down and product, process, and people are aligned to think and act strategically.

## Recommendations

### *U.S. Government's Role in Supply Chain Management*

We see government's role in Supply Chain Management as twofold. First, the U.S. Government should begin working with global industry to establish an industry-wide standard for RFID technology. Both civilian corporations and, mores specifically, the DoD will benefit from a standard in RFID. An accepted standard for RFID will eliminate non-compatible, redundant systems between both civilian and government agencies reducing overall costs while improving supply chain management. Secondly, the government should work closely with industry as they balance U.S. border security with the flow of commercial products affecting the U.S. economy. The free flow of goods should never compromise U.S. security, but enforcement of border security should not inhibit the flow of goods to market.

With the exception of both RFID technology and border security, the U.S. government should remain in a supportive role with industry to enable supply chain processes. Currently, civilian industry leads the way in supply chain innovation and government agencies should follow their lead.

***Information Technology Solutions***

DoD's current efforts under the office of the Defense Business Transformation Agency (BTA) are a positive step towards the acquisition of a more effective and efficient war fighting support system. It should be the responsibility of this office, as a single authoritative agent, to ensure the proper acquisition of logistics support technology that can effectively implement ERP environments and an RFID information support system across all of the Services and agencies. Each new support system must be transparent to all existing systems. Following are specific recommendations for ERP and RFID based on our research.

***Enterprise Resource Planning.*** Current information technology solutions within the commercial industry present possible applications within the DoD. The pursuit of a total access information environment under the umbrella of ERP is promising when applied to the projection and sustainment of military forces to enhance both surge and mobilization capabilities. Currently, the Services, along with several agencies within DoD, are in varying phases of establishing deployment and distribution-oriented ERP environments to better serve their customers. However, due to the Title X responsibilities of the Services, the numerous organizations under DoD, and the vast scope of the effort, it is highly unlikely that a single implementation of an ERP environment can be accomplished. Therefore, the U.S. military should pursue a common architecture in which all components of DoD are compliant and can pass information via web-based technology.

***Radio Frequency Identification.*** Developing and promulgating a DoD RFID policy was the critical first step. In the future, the challenge will be to modify the policy based on feedback from the field and to ensure that adequate funding for equipment and infrastructure continues even when the logistics failures of OEF and OIF are memories. For the present, DoD will remain the major user of active RFID (although increasing use of active tags for container security may change that in the future). USTRANSCOM must continue its efforts to emplace readers at major strategic sea and air ports both in the continental United States (CONUS) and wherever possible overseas. Additionally, a joint, expeditionary capability should be created that can rapidly establish RFID networks at ports of debarkation or critical nodes anywhere in the world in support of surge and mobilization. The current active policy calls for applying tags to all shipments from origin even though the data on the tag often only becomes critical once the shipment is in theater. Future refinements should consider requiring complete and reliable data from shippers in TAV systems and allowing the Combatant Command (COCOM) to designate which shipments (by type and destination) need to be tagged. These tags could then be applied at the strategic port of debarkation using the data in the TAV systems. The DoD is leveraging the experience of Wal-Mart and other major retailers as they develop RFID requirements and both sides will benefit from combined influence as we move to second generation, open architecture tags.

***Supply Chain Security***

Although supply chain security initiatives and maritime security innovations are important, they are the responsibility of federal agencies and international organizations other than DoD. However, DoD can, and should, work closely at an inter-agency level on the various container security initiatives. By leveraging RFID technology with industry for in-transit

visibility of assets and containers as is currently being accomplished, DoD can assist in the development of inexpensive technologies for container security. Container security and in-transit visibility go hand-in-hand with each other, and DoD will be instrumental in the future development of this technology.

### *Strategic Alliances*

***Third Party Logistics.*** 3PL providers are a proven supply chain enabler. Although 3PL providers are currently used within the DoD, the Services and agencies need to further validate those core competencies that should remain in house and identify those supply chain support efforts that can be appropriately outsourced.

A business case analysis can lend itself to those supply chain functions for which the commercial world has already turned to 3PL providers:

- Shift from push to pull supply chain management
- Transportation activities to include less than full truckload and cross-docking distribution management
- Inventory and warehousing management responsibilities
- Supply Chain Data Management/IT systems development, data management, metrics management and full customer transparency

The 3PL industry has broadened its service offerings in response to business globalization and manufacturers/suppliers' desire for one-stop shopping. It was noted that, "As more companies source, manufacture, distribute, transport, and sell products using vendors in every corner of the world, they count on 3PLs to streamline the supply chain through proactive vendor management and product lifecycle management (Partridge, p. 96, 2005,)." The DoD needs to continue to identify these "non-core" functions accordingly and afford themselves the comparative advantages that 3PLs can offer.

***Strategic Sourcing.*** In 2005 the Department published the DoD-wide Strategic Sourcing Concept of Operations (DWSS CONOPS) based on Deputy Secretary of Defense (DEPSECDEF) direction to "capture greater value from the tremendous amounts of dollars spent on acquisitions" (DoD-Wide Strategic, p. 6, 2005,). The CONOPS is a good start at addressing the sourcing "3P's" previously discussed in this paper. However, it has a "commodity focus," and only primarily addresses the "structural" barriers to strategic sourcing; i.e., inadequate coordination across the Services, lack of standardized processes, and poor knowledge-sharing mechanisms. Clearly, the Department should continue these efforts. However, the ultimate goal must be to enforce Department-wide cooperation for all strategic acquisitions. All too often, the individual Services are allowed to "wiggle out" of joint programs through parochial funding decisions. Therefore, we recommend that once a joint acquisition program is approved by DoD, any changes to Service-provided funding or assets for the program must be approved by the Office of the Under-Secretary of Defense for Acquisition, Technology and Logistics (OUSD AT&L) and, in some cases, the Joint Requirements Oversight Council (JROC). This discipline will greatly enhance the stability and likelihood of success for joint acquisitions.

## **Conclusion**

Our industry travel, both domestically and internationally, has shown Supply Chain Management innovations in both the civilian and government sectors. In the area of information

technology, civilian industry has led the way in the development of ERP environments, while the DoD remains a strong leader in RFID application. As we look towards the future of continued supply chain security initiatives, it is critical that the U.S. government work closely with industry to enable the flow of goods to market. In addition, strategic alliances will remain a critical part of an industry's strategic goals and objectives. Ultimately, our industry study taught us that several innovative supply chain management processes have revolutionized industries across the board.

The combined impact of collaboration and the strategic supply chain relationships associated with Supply Chain Management have brought about increased profits, lessened the supply chain risk, lessened the need for large on-hand inventories and increased customer satisfaction. These improvements have also created collateral processes such as service differentiation and reverse logistics as well as created new opportunities for 3PL companies. Process improvements have virtually eliminated the infamous "bullwhip" effect in forecasting that was prevalent in the past. The bullwhip effect, a term used to describe extreme fluctuations in forecasting predictions, created inventory lags and overstocks that were both costly and inefficient.

While these processes are invaluable to successful SCM, they are not without risks. Companies are cautioned to develop a strategy that incorporates only those processes that are necessary and can be effectively managed. So far there have been no major instances of companies compromising the trust bond that is requisite for these relationships to be successful. In the future it is expected that the continuation of globalization of industries that move, sell, and make products across international boundaries will require even more collaboration between business partners. Additionally, as technological innovations that increase the availability of information become more mature, such as ERP and RFID, even more opportunities for partnering will emerge. Linda Sanford put it best in her article "Businesses Must Learn to Let Go" when she summarized the impact of globalization with the following, "Companies outperforming their peers today…have adopted an approach to building the 21st century business in which they find their place not by strengthening their command and control posture, but by focusing on their core expertise, collaborating with partners in innovative ways that drive value and growth for all participants, and strategically sourcing the rest. I call this philosophy: 'Let go to grow' (Sanford, 2006)."

# Appendix A

Examples of current RFID applications grouped by type of tag used (Jackson, 2005).

Inductive Tags:

- Electronic Article Surveillance (EAS)
- Antitheft systems
- Access control systems
- Personal identifications systems
- Wild life management
- Pet identification
- Product identification
- Vehicle Access & Security

Back scatter Tags:

- Toll Collection
- Traffic Management Systems
- Inter modal Container Management
- Asset Tracking
- Rail Car Identification
- Rail Control Systems

Active Tags:

- Traffic Management Systems
- Inter modal Container Management
- Mfg. Process Control
- Waste Management
- High Value Asset Control

# Appendix B

Examples of RFID use by specific companies or agencies:

- Radar Golf Inc. produces a "radar" golf ball that uses an RF tag to measure distance and spin and incorporates a “BPS” or ball positioning system enables a golfer to find a "lost" golf ball when a handheld device is pointed toward a ball within 30-100 feet (LaPedus, 2005)

- Airbus will equip its new A380, the largest commercial jet, with RFID chips – 10,000 of them. The 555-passenger jet will have passive RFID tags on removable parts such as passenger seats, life vests, and brakes. RFID-tagging airplane parts will reduce the time it takes to generate aircraft-inspection reports. In April 2004, Boeing announced its 7E7 Dreamliner program, which will use RFID smart labels to store maintenance and inspection data on time-controlled, limited-lifetime parts, and replaceable units (Malykhina, 2005).

- Associated Food Stores, a cooperative of over 500 supermarkets in the western United States, uses an RFID-based real-time locating system at its distribution center to improve yard management. The system allows yard managers to know when trucks or trailers enter or leave the yard, where these assets are located in the yard along with their status – a temperature spike would indicate, for example, that a refrigerator unit’s door was left open.

- The Transportation Security Agency and Delta Airlines have conducted two tests of passive tags to track baggage. The tags contained flight number, passenger name, and "license plate" data-- a serial number that identifies each bag. TSA plans to conduct future tests with bags programmed at one frequency to see if they can be read at another frequency in the relatively narrow 900-MHz band to overcome the differing international standards. If these tests are successful, it would demonstrate the potential for international interoperability (Brewin, 2004).

- Prada, the fashion house, is using RFIDs in its Epicenter store in New York City to enhance the shopping experience with kiosks that give customers access to product information such as cut and fabric details, designer sketches and runway demonstrations in addition to suggestions on accessories or alternative products (Brewin, 2002).

- Ford Motor Co.'s facility in Cuautitlan, Mexico, is using RFID for accurate and efficient routing and identification of vehicles through the production process. As the vehicle moves from one stage of production to another in the assembly process, interagators read different parts of the 20-plus-digit serial number on the RFID tags, which indicate the specific operation that needs to be done at each station (Angeles, 2005)

- The Port of Singapore uses RFID technology combined with an Electronic Data Interchange (EDI) system to track the thousands of intermodal containers that transit its facilities every day. Thousands of RFID transponders have been installed on the roads of the port to form a multi-dimensional grid. A centralized EDI system places and locates containers in the staging areas based on the information contained on the RF tags (Angeles, 2005).

# Appendix C

RFID benefits across the supply chain (Kambil & Brooks, 2002)

Table 2: Auto-ID Value Chain Opportunities

KEY

1. Priorities
**M** – Manufacturers
**L** – Logistics Providers
**R** – Retailers

2. Reader Requirement
**F** – Few (e.g., at doors)
**S** – Some (e.g., at workstations)
**M** – Many (e.g., on shelves)

3. Tags
A) Level
**P** – Pallet
**C** – Case
**I** – Item

B) Marginal Benefit
**L** – Low
**M** – Medium
**H** – High

| PRIORITIES M | L | R | FUNCTION/ ACTIVITY | POTENTIAL BENEFITS | READER REQUIREMENTS | TAGS P | C | I |
|---|---|---|---|---|---|---|---|---|
| | | | **CROSS-SUPPLY CHAIN** | | | | | |
| M | | R | **DEMAND PLANNING** | – Reduced or eliminated out-of-stocks<br>– Decreased order lead time<br>– Automated planning tied to consumer purchases<br>– Increased inventory turns<br>– Decreased safety stock | F, S, M | | H | M |
| | | | **ITEM/BATCH/ LOT TRACKING** | – Reduced sale of counterfeit products<br>– Increased compliance w/distribution contracts<br>– Increased product quality | F, S, M | | | H |
| M | | R | **SECURITY** | – Decreased unauthorized access to facilities<br>– Decreased chances for product tampering | | | | |
| | | | **MANUFACTURING** | | | | | |
| | | | **PROCUREMENT & MATERIALS STORAGE** | – Reduced order lead time<br>– Increased raw material availability<br>– Higher capacity utilization | S, M | | M | M |
| | | | **PRODUCTION** | – Higher capacity utilization<br>– Reduced order cycle time<br>– Increased quality | S | | L | H |
| | | | **WAREHOUSING** | | | | | |
| | | | **RECEIVING** | – Decreased unloading times<br>– Increased accuracy of accepted shipments | F | L | H | L |
| | | | **ORDER SELECTION** | – Increased accuracy of orders<br>– Increased order fill rate | S, M | L | H | L |
| M | | | **EXCEPTION PRODUCT LOCATION** | – Fewer misplaced items<br>– Decreased time to locate specific items | M | L | H | L |
| | | | **LOSS PREVENTION** | – Reduced shrink | F, S, M | | M | L |

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